CSE 102 – Assignment 3

Introduction

This assignment has two components. The first is a traditional "pencil-and-paper" portion, which does not involve any programming at all. The non-programming questions (at this link in Word format and at this link in pdf format) will not be demoed, but will be submitted electronically (submission instructions to come later). The programming portion of the assignment is below. Demo it to a TA or instructor as usual. This assignment is to be done solo.

Bit-level and Logical Data Manipulation

This exercise is designed to get you to investigate the various logical operations available in the C language. Specifically, for this assignment you are limited to using the Boolean Operators (&&, ||, and !) and Bitwise Operators (&, |, ^, ~, <<, and >>) that are documented here.

Declare an input array of reasonable length:

```
int input[] = {. . .};
```

Using only the bitwise and Boolean operations listed above (i.e., no if-then tests are allowed), write functions (where the work gets done in one expression) that return 1 for the described condition and 0 otherwise. You may assume `x` is an integer (of type `int`); however, see below for how this needs to generalize.

(a) Any bit of `x` equals 1.
(b) Any bit of `x` equals 0;
(c) Any bit of the least significant byte of `x` equals 1.
(d) Any bit of the most significant byte of `x` equals 1.

Execute all 4 functions on each element of the input array. Print out the results on the desktop PC in the following format: one line per element, first print the input value, then the output of each function, with each number being separated by spaces.

To get full credit, all four functions should not depend on the input `x` being 16 bits long, but should also work for a 32-bit input as well (i.e., of type `long`). Substantial partial credit will still be available for those whose solution only works for 16-bit input values.

Submitting Your Work

When you have finished your assignment and demonstrated it to the instructor or TA, make sure they record your completion.